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(56) Documents cited  
**GB 2022185 A GB 1588673 A GB 1567001 A**

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(54) **Electromagnetically controlled cat door**

(57) A cat door designed to selectively admit only cats carrying a small magnet on their collar has a door (1) pivotally mounted in a frame (2). The door is normally prevented from opening into the house by a catch (6) operated via a solenoid (5). The solenoid is energized in response to the sensing of the cat's magnet by a reed switch arrangement consisting of 2 or more reed switches connected electrically in parallel and positioned near the end of an extension of the lower surface of the frame, circumferentially of the aperture. The arrangement provides a cheap alternative to previous known devices, and responds to any angle of approach of the cat.

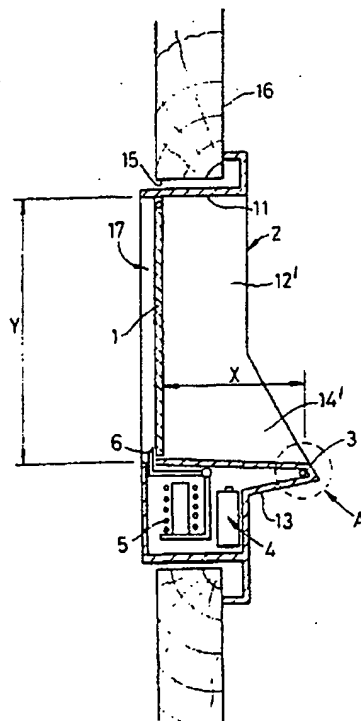


Fig. 1

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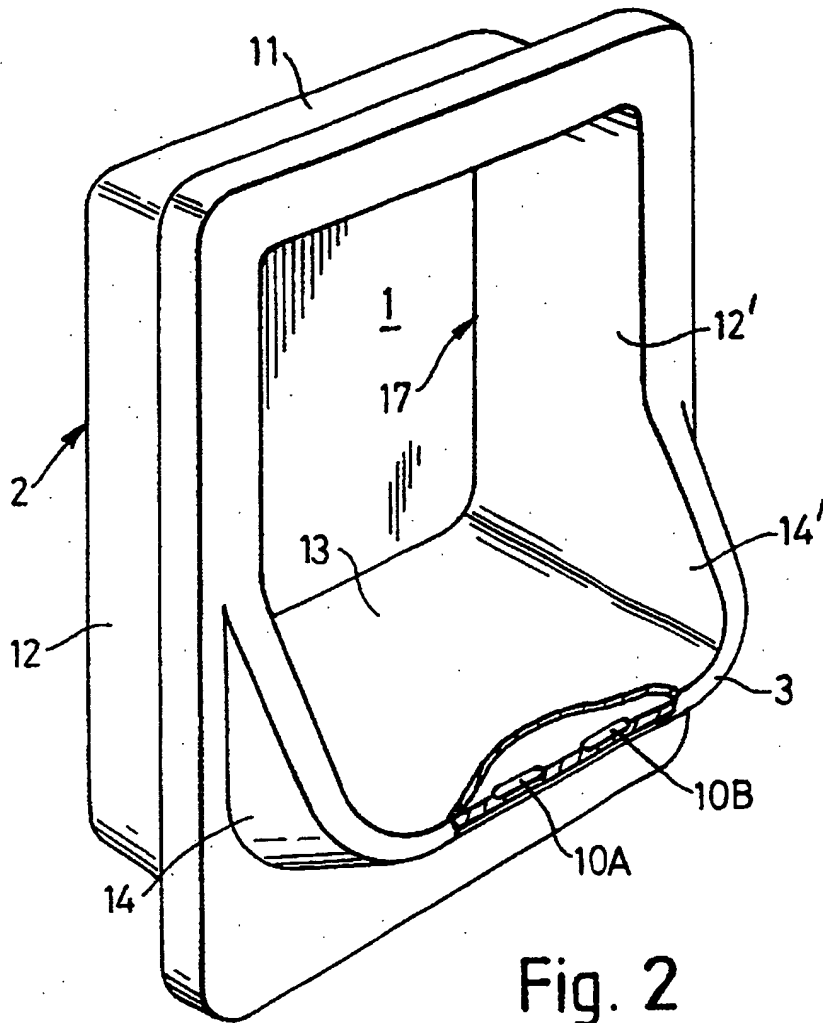


Fig. 2

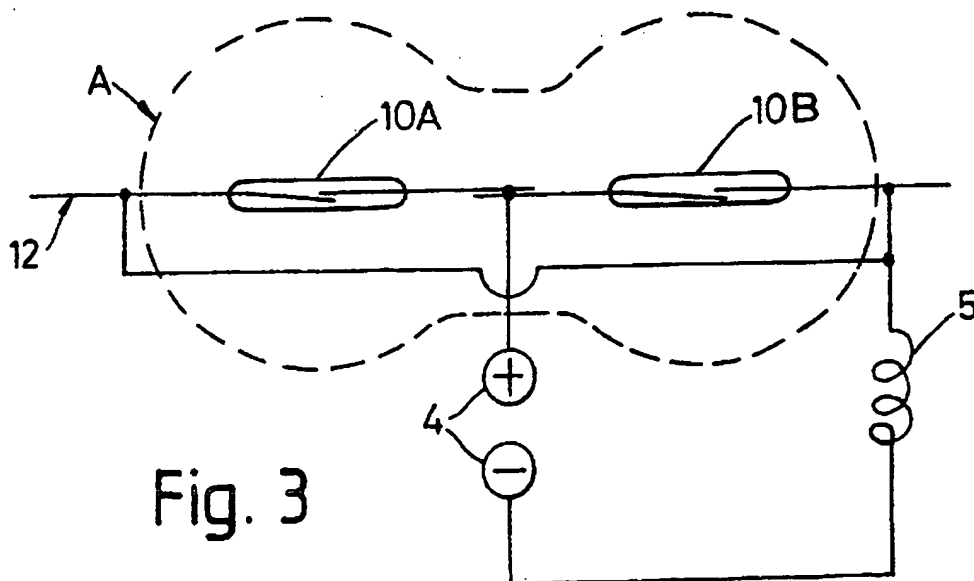


Fig. 3

## IMPROVED ELECTROMAGNETICALLY CONTROLLED CAT DOOR

This invention relates to an improved electromagnetically controlled cat door. The term "cat door" has been used herein as relating to an entrance designed for small animals such as cats.

Cat doors are frequently fitted to houses to provide a means for the cat to enter and leave the house of its own will. Such a cat door will typically take the form of a door pivotally mounted in a frame, the door being of a size such that the cat can readily push the door open. Gravity, or small spring force then returns the open door to its closed position in order to eliminate unwanted draughts.

One drawback of such cat doors that concerns many cat owners is that stray cats will often try to enter the house.

In order to prevent this problem different forms of "selective" cat doors have been designed. Such designs ensure that the door is locked into the house by a latch that is rendered inoperative in response to an "operator" carried by the cat.

A review of known solutions, and their associated drawbacks, will now be given:

UK Patent No. 1567001 presents a solution utilising a magnetic responder linked to a latch member that is attracted towards an operator made of soft iron or to a bar magnet attached to the cat's collar. The principal drawback of this arrangement is

that the responder and latch member have a very high inertia and will not always respond quickly enough to a cat's magnet passing over the magnetic responder. Thus, the cat may not have deactivated the latch by the time that it presses the door against the latch. From this point on, the friction of the latch against the door will prevent operation.

The same patent also puts forwards two other possible ways of producing a selective cat flap, although little detail is given. One solution is provided by using a magnetic switch. Such an arrangement, particularly when executed with a reed switch, overcomes the problem of slow response. It is also very cheap to produce, as reed switches are available in quantity at very low cost. However, even with the most sensitive reed switches used in conjunction with the largest magnets a cat can practically carry, the cat must be capable of reliably positioning its magnet within an approximately spherical envelope of response extending to only 2.5cm or so from the switch centre. This cannot be relied on in practice as cats will often wish to enter the door from different angles. It is not at all unusual, for instance, for a cat to enter a cat door by pressing at one or other of the sides of the door. Such behaviour could clearly cause a significant problem if there is no means to guide the operating magnet into sufficient proximity to a centrally mounted switch. It might be argued that a very narrow door might overcome this problem, but in practice, if such a door is constructed for a small cat,

it would be too narrow for a large cat to enter.

The problems of using a single magnetic switch are largely overcome by the remaining proposal in Patent 1567001, namely by using an inductance loop extending around the opening in conjunction with a control circuit to detect change in inductance. The major problem with this solution lies in the high cost of production. It is also possible that such a system could be incorrectly triggered by, say, a cat wearing a steel address-carrying barrel, or even by a buckle on a collar.

UK Patent 1588 673 presents a solution using a magnetically operable switch in conjunction with adjustable biasing means. In this way, it is possible to render a single reed switch sufficiently sensitive to allow for the deficiencies of using a single unbiased switch. However, in practice such a solution demands relatively expensive circuitry to create a time delay and then energise a resetting coil positioned around the reed switch in order to reopen the reed switch, which could otherwise remain closed under the influence of the biasing magnet.

Another disadvantage of this solution is that the adjustable biasing needs adjustment in situ to compensate for local magnetic effects. This can be an awkward, and is certainly an undesirable, task for the cat owner to perform.

A further solution is provided by US Patent 4022263 in which

the problem of encouraging the cat to enter the door centrally and thus come into sufficient proximity to a single unbiased magnetically operable switch is achieved by mounting the switch on an external door taking the form of a flexible iris positioned in front of an interior swinging door. The swinging door is normally retained by a solenoid catch such that when the catch is depressed the door swings out of position under force of gravity and is then free to allow the cat full entry into the house. The swinging door is recocked once the cat has passed through the door (in either direction). In practice it cannot be guaranteed that the cat's passage through the door will ensure that the swing door is recocked. Certainly if the cat passes slowly enough through the door such an action will not occur, thus rendering the flap non-selective. Another disadvantage of this solution relates to the expense of production - largely as a result of the two door construction. A further disadvantage of this system concerns the bulk of the unit, which renders it unsuitable for installation in a domestic door.

It is an object of the present invention to produce a selective cat flap of minimum cost that overcomes all the disadvantages associated with existing solutions.

According to the present invention there is provided an electro-magnetically controlled cat door comprising a door pivotally mounted in a door aperture of a frame and an

electrically controlled catch mechanism normally preventing opening of the door in at least one direction that is released when a magnet carried by an animal approaching the door is sensed by an arrangement of two or more reed switches on or in the frame connected electrically in parallel, said switches being disposed in an array extending circumferentially of said door aperture.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawings, in which:

Figure 1 is a sectional elevation of an electromagnetically controlled pet door installed in a house door,

Figure 2 is a perspective view of the Frame of Figure 1 with the door removed and partly broken away to show the location of two reed switches, and

Figure 3 is a circuit diagram of the electrical assembly.

A door, (1), is pivoted from its upper edge within a frame (2) fitted in an aperture (15) in a door (16). The Frame (2) defines a generally rectangular aperture (17) which is closed by the door (1) when the latter hangs upright as shown in Figure 1. Two normally open reed switches (10a,10b) of approximately 10 Ampere turns sensitivity are mounted coaxially in the distal edge of an extension (3) of the lower surface of the frame (2) (figure 2), their common axis (12) being parallel with and spaced outwardly of the plane of the aperture (17). The reed switches (10a,10b) are connected electrically in parallel (Figure 3) with a power



source (4), and a solenoid, (5), that disengages a door catch (6) when energized. Connected in this way the reed switches can ensure a common detection zone elongated circumferentially of the frame (2), or extending across the desired width of the frame (2). To achieve such a common detection zone the centres of the reed switches (10a,10b) need to be spaced some 3.0cm apart, dependent on the particular reed switch characteristics.

This ensures that the detection zones of the individual reed switches overlap, as shown, sufficiently to provide an almost 'cylindrical' detection zone of approximate radius of 2.5cm, extending approximately 2.5cm at each end beyond the centre points of the outermost reed switches and along an axis defined by the common longitudinal axes of the reed switches. The detection zone is indicated by the dotted line A in Figures 1 and 3.

When a magnet (not shown) carried on the collar of a cat approaching the door (1) from the right as viewed in Figure 1 enters this zone (A), at least one of the switches (10a,10b) will close, causing the solenoid (5) to be energised and in turn releasing the latch (6). The door can now be pushed open, swinging to the left as viewed in Figure 1, as the cat continues through the aperture (17).

In practice this situation is easily achieved in mass manufacture by careful selection of 2 critical dimensions of the cat door structure in order to suit the anticipated size

range of cats likely to use the door. Firstly, the height of the door (Y) should be kept to a minimum to ensure that a small magnet attached to the cat's collar is forced to move into the detection zone (A). Secondly, the horizontal distance (X) from the exterior surface (13) of the cat door to the centre line (12) of the reed switches (10a, 10b) should be adjusted to a dimension similar to the horizontal distance from the cat's nose, which is used to push the door (1) open, to the position in which the magnet normally hangs. In practice, for most cats, a dimension 'Y' of approximately 15cm has been found to be suitable and no adjustment would normally be necessary outside of this guideline. If necessary, it would be possible to hang the magnet on the cat collar a little lower. Similarly, the preferred dimension for 'X' is approximately 10cm. This latter value of 'X' is based on the largest cats likely to use the door because, once one of the reed switches (10a, 10b) has been closed, hysteresis effects will keep the switch closed until the magnet is some 4cm away from the switch, dependent on the characteristics of the particular reed switches (10a, 10b) and operating magnet used. In this way the latch (6) remains deactivated sufficiently for a small cat or kitten to push the door (1) open with its nose before the latch (6) is reactivated. However it is clear that the Frame (2) could be provided with mechanical arrangements designed to adjust both the vertical height available over the reed switches (10a, 10b), and the

horizontal distance from the outer surface (13) of the door to the centreline (12) of the reed switches (10a,10b).

The door catch, (6), is lightly spring-loaded so as normally to prevent entry into the house. However, after the

cat has passed through the door to the inside of the house, an angled face (14) of the catch is struck by the returning door (1) and depressed momentarily thus engaging the catch again.

In the arrangement shown it is not necessary for the catch (6) to be released when the cat pushes the door (1) open to exit the house, ie when moving through the frame aperture (17) from left to right as viewed in Figure 1. Closure of one or more of the reed switches (10a, 10b) at this time will not matter. By the time the full length of the cat has passed through, its magnet will no longer be in the zone A.

# CLAIMS

1. An electro- magnetically controlled cat door comprising a door pivotally mounted in a door aperture of a frame and an electrically controlled catch mechanism normally preventing opening of the door in at least one direction that is released when a magnet carried by an animal approaching the door is sensed by an arrangement of 2 or more reed switches on or in the frame connected electrically in parallel, said switches being disposed in an array extending circumferentially of said door aperture.

2. A cat door as claimed in Claim 1, wherein the reed switches are disposed in the frame co-axially with their common axis parallel with the plane of said aperture and spaced therefrom oppositely to the said one direction.

3. A cat door as claimed in either preceding claim wherein the reed switches are positioned in an outward extension of the lower surface of the frame in which the door pivots.

4. A cat door as claimed in any preceding claim in which the position of the reed switches is adjustable to suit the physique of a particular animal.

5. A cat door as claimed in any preceding claim wherein the catch releasing means includes a solenoid for releasing the catch when energized through the closure of any one of said reed switches.

6. A magnetically operated cat door substantially as hereinbefore described with reference to and as shown in the accompanying drawings.